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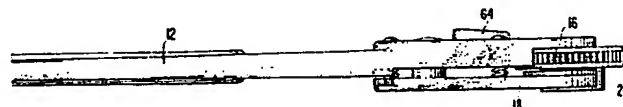
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54 **Novel socket wrench assembly.**

57 A handle member (12) terminates in an expandable yoke containing a fixed upper half (16) and an expandable lower half (18) for movement from an expanded open position for receiving a socket (24) to a closed position in driving engagement with the socket. A curved rib is formed transversely on the inner surface of each yoke half. A split ring-like nut driving socket (24) contains exterior ratchet teeth and a circular bore formed transversely through the socket with a recessed counter bore forming a circular guide channel received in rotational engagement with the curved ribs of the yoke halves (16, 18). The socket contains a curved head having lands which in combination define a polygonal wrench opening. A pawl mechanism (60) mounted on the wrench handle member is resiliently biased into engagement with the ratchet teeth.



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High torque expandable socket ratchet wrench

The invention generally relates to ratchet wrench construction and more specifically to improvements to ratchet wrenches of the socket type usable in areas of limited access normally limiting wrench use to the open-ended type.

There are number of applications in which a closed-end or socket wrench is preferred for use in making or breaking a high torque union. In locations with a turning radius of at least 30 degrees, the open-ended wrench may be used by merely reversing of the wrench position with each turn. The wrench, of course, must be inserted, turned, removed, and then reinserted. This action is both time-consuming and difficult if the element is not turned the proper amount.

Additionally, there are a number of instances where the nut or bolt head is disposed in a relatively inaccessible location which limits the stroke range for back and forth manipulations and, of equal importance, limits the area in which a ratchet wrench may be positioned to engage the nut or bolt.

It is therefore, the principal object of the present invention to provide a ratchet wrench having a split ring-like socket head which can be positioned around a nut or bolt head to permit the wrench to be moved into torque transmitting engagement with the wrench lands of a nut or bolt head and thereafter operated as a closed box ratchet wrench for making or breaking a union.

Another object of the invention is to provide a ratchet wrench with an expandable yoke which permits the wrench to be moved into torque transmitting engagement with the socket head by means of movement of the wrench handle transverse to the socket axis in areas of limited access which preclude movement of the

wrench handle longitudinal to the socket access until the yoke telescopically receives the socket.

Yet another object of the invention is to provide a high strength split ring-like socket assembly for use in a ratchet wrench which socket assembly permit circumferential engagement of a nut through movement of the socket transverse to the socket axis.

Yet another object of the invention is to provide a ratchet wrench having a split ring-like socket which is readily removable and interchangeable with other similar sockets to permit the wrench to be used in combination with nuts or bolt heads of a variety of standard drive head configurations.

The foregoing and other objects are accomplished in the present invention by a ratchet wrench assembly in which a split ring-like socket is rotatably journaled with the yoke portion of a ratchet wrench. A handle member terminates in an expandable yoke portion containing a fixed upper half and an expandable lower half for movement from an expanded open position for receiving a socket through movement transverse to the socket axis to a closed position in engagement with the socket. A curved rib is formed transversely on the inner surface of each yoke half. A split ring-like nut driving socket contains exterior ratchet teeth and a circular bore formed transversely through the socket with a recessed counter bore forming a circular guide channel in the socket concentric with the transverse bore. The socket guide channel is received in rotational engagement with the curved ribs of the yoke halves. The socket contains a curved head having lands which in combination define a polygonal wrench opening. A pawl mechanism mounted on the wrench handle member is resiliently biased into engagement with the ratchet teeth of the socket, thereby allowing it to turn

in one direction only and preventing rotation of the socket in the opposite direction.

The novel features which characterize the invention are defined by the appended claims. The foregoing and other objects, advantages and features
5 of the invention will hereinafter appear, and for purposes of illustration of the invention, but not by way of limitation, and exemplary embodiment of the invention is shown in the appended drawing.

10 Figure 1, is a top plan view of the socket ratchet wrench constructed according to the teachings of the invention.

Figure 2, is a side view of the wrench shown in Figure 1 with the lower yoke half in expanded
15 position.

Figure 3, is a side view of the wrench shown in Figure 1 with socket engaged.

Figure 4, is an expanded view of the wrench shown in Figure 1.

20 Figure 5, is a sectional view showing mounting screws in expanded and closed positions.

Figure 6, is a perspective view of the socket assembly in closed and open positions.

25 Figure 7 is an isometric view of a socket member for the socket wrench assembly of the present invention;

Figure 8 is a side view of the socket member of Figure 5;

30 Figure 9 is an element of the socket member of Figures 5 and 6; and

Figure 10 illustrates another socket member for use with the socket wrench assembly of the present invention.

35 In the description which follows, the parts are marked throughout the specification and drawing

with the same reference numerals, respectively. The drawings are not necessarily to scale and in some instances portions have been exaggerated in order to more clearly depict certain aspects of the invention described.

Referring now to Fig. 1, a high torque expandable socket ratchet wrench assembly constructed according to the teachings of the invention is identified generally by the reference numeral 10. The principal components of the ratchet wrench assembly include an elongated handle member 12 which is connected at one end by an expandable yoke assembly 14 having a fixed top half 16 and an expandable bottom half 18, as shown in Figs. 2 and 3. The yoke halves are coupled for expansion and contraction between open and closed positions by means of resiliently biased retaining screws 20 and detent gear assembly 22. Received in rotational coupling engagement with the upper and lower yoke halves is split ring-like socket assembly 24.

As best observed in Fig. 6, the socket assembly 24, comprises a pair of complementary substantially semi-circular members 26, 28 coupled by means of pin 36. Each socket member includes a curved head 30 having interior land wrench surfaces 32 which in combination define a polygonal opening 34.

Additionally, each socket member include a circular bore 38 which is intersected by a counter bore 40 having a recessed inner side wall 42 defining a curved guide channel. The curved rib 44 of each yoke half is journaled for rotation in the guide channel 42. Each guide channel and rib are preferably rectangular in cross section and extend along a semi-circular path.

According to an important feature of the invention, this overlapping, journaled engagement of the socket guide channel and yoke rib produces an

interlocking engagement of the wrench yoke and socket resulting in a stable structure having a high torque transmitting capacity.

5 Secured to each yoke member is a curved ratchet 44, 46 which in combination define a continuous ratchet wheel as best seen in Fig. 6. Each curved ratchet includes a series of teeth 48 for engaging a pawl 50 carried on the fixed yoke member 16.

10 According to an important feature of the invention, socket member 28 contains a single tooth member 54 which extends beyond the plan of side wall planar surface 56 for mating engagement into the recess 58 of socket member 26 created by the absence of a single ratchet tooth member. This mating of socket
15 members 26 and 28 produces an interleaved engagement resulting in a structure having a high stable closed bond.

 Referring to Fig. 4, the pawl 50 is resiliently biased by means of spring 58 and ball-bearing 60 with the teeth 44 of socket 24. The pawl 50
20 is pivotally mounted and anchored in place by spring retainer 62. A selector switch 64 permits indexing of the pawl 50 so as to permit ratcheting in either a clockwise or counterclockwise direction.

 According to a further important
25 feature of the invention, yoke halves 16 and 18 are coupled together by means of resiliently biased retaining screws 20 and springs 66 for movement from a closed position in engagement with socket 24 as shown in Fig. 3 to an expanded position for engaging the
30 socket member. The yoke halves are maintained in open position by means of a plunger 22 and detent gear 70.

 Referring now to Figs. 4 and 5, the compression springs 66 resiliently bias yoke halves 16, 18 into closed position. Upon depression of plunger 22,
35 yoke half 18 is displaced a given distance of sufficient

width to engage socket member 24 and is held in expanded position as shown in Fig. 5 by means of detent gear 70 which operates in similar fashion to a conventional ballpoint pen. In this expanded position, handle
5 member 12 is moved transverse to the socket axis so as to engage socket member 24 previously positioned about a given nut or bolt head by means of movement transverse to the nut or bolt head axis. Upon subsequent depression of plunger 22, yoke half 18 is caused to be returned
10 to its original closed position by means of biasing springs 66, thus achieving interlocking engagement with socket member 24.

A socket member, generally indicated as 60, referring now to Figures 7 to 10, is comprised
15 of semidisc-shaped elements 62 and 64, each formed with rectangular - shaped outwardly extending continuous toothed or serrated sections 66 with upper and lower conically-shaped surfaces 68 and 70, respectively referring specifically to Figure 8. Each of the elements 62
20 and 64 are formed with three rectangularly-shaped surface 102 disposed at an angle of 120° to each other about a major axis of the socket member 60 thereby defining therebetween a hexagon for positioning of the socket member 60 about a hexagonally-formed stud (not shown).
25 The upper and lower conically-shaped are dimensioned to cooperate with the upper and lower inner walls formed on the wrench (not shown).

Each of the elements 62 and 64 comprising the socket member 60 is formed with a hinge portion
30 and referring to Figure 10, the element 62 is formed with a lower hinge portion 74 including an orifice 76 whereas the element 64 is formed with an upper hinge portion 78 including a pin 80 which cooperates with the orifice 76 in the lower hinge portion 74 of the element 64
35 Opposite the hinge portions 74 and 76 of the elements 62

and 64, respectively, there are formed interlocking arm members 82 and 84, respectively, which cooperate to form an integral socket member 60, particularly when positioned within the socket wrench assembly 10
5 when the yoke members are in a closed position.

It will be understood by one skilled in the art that the configuration of the yoke halves 16 and 18 of the expandable yoke assembly 14 would be modified in order to cooperate with the surfaces 68
10 and 70 or the drive socket assembly illustrated in Figures 7 to 10.

From the foregoing description of a preferred embodiment of the invention, those skilled in the art will appreciate that the expandable ratchet
15 wrench of the present invention provides a high torque capacity ratchet assembly which may be quickly and easily utilized in situations requiring a ratchet or a closed box end wrench in areas of limited access. The provision of the interleaved yoke rib and socket
20 channel combination strengthens and stabilizes the the wrench structure.

Although a preferred embodiment of the invention has been described in detail, it should be understood that various changes, substitutions and
25 alterations can be made therein without departing from the spirit and scope of the invention as described.

CLAIMS

1. A wrench usable in areas of limited access usually requiring an open-end wrench while having the high torque characteristics of a closed-end or socket wrench, comprising :

An elongated handle member terminating in a two-piece expandable yoke;

An upper yoke half fixedly formed on one end of said handle member, said yoke half having a curved opening;

A lower yoke half expandably mounted to said handle member and having a curved opening;

A split ring-like nut driving socket comprising a pair of complementary relatively movable substantially semi-circular members each having a curved head for circumferentially engaging a nut through movement transverse to the socket axis and for coupling in rotational engagement with the curved opening of the upper and lower yoke halves, each curved head having exterior ratchet teeth and interior wrench land surfaces which in combination define a polygonal opening;

A pawl mechanism mounted on said handle member and resiliently biased in engagement with said socket allowing it to turn in one direction only, and preventing rotation of said socket in the opposite direction; and

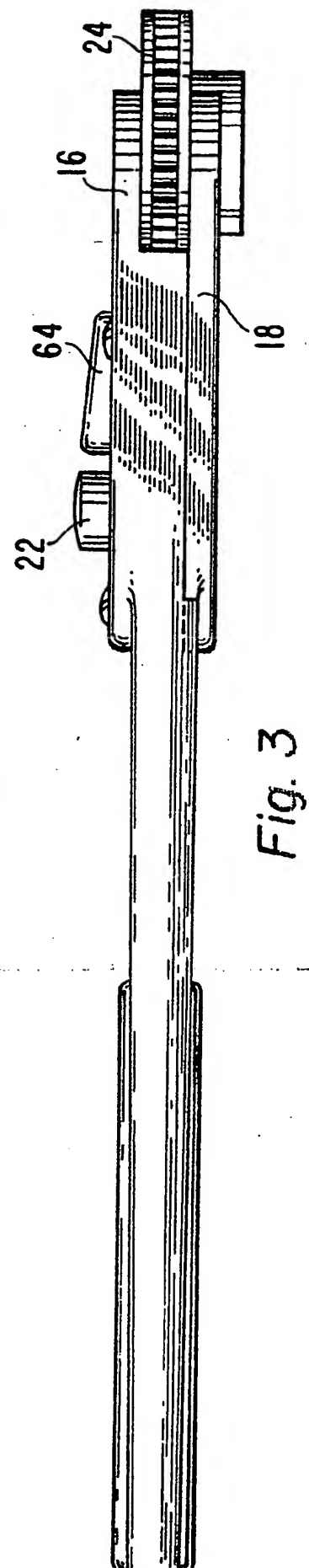
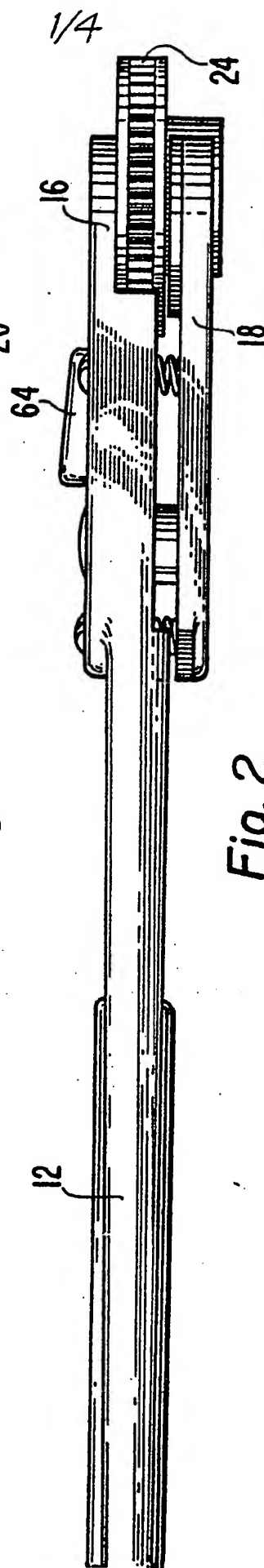
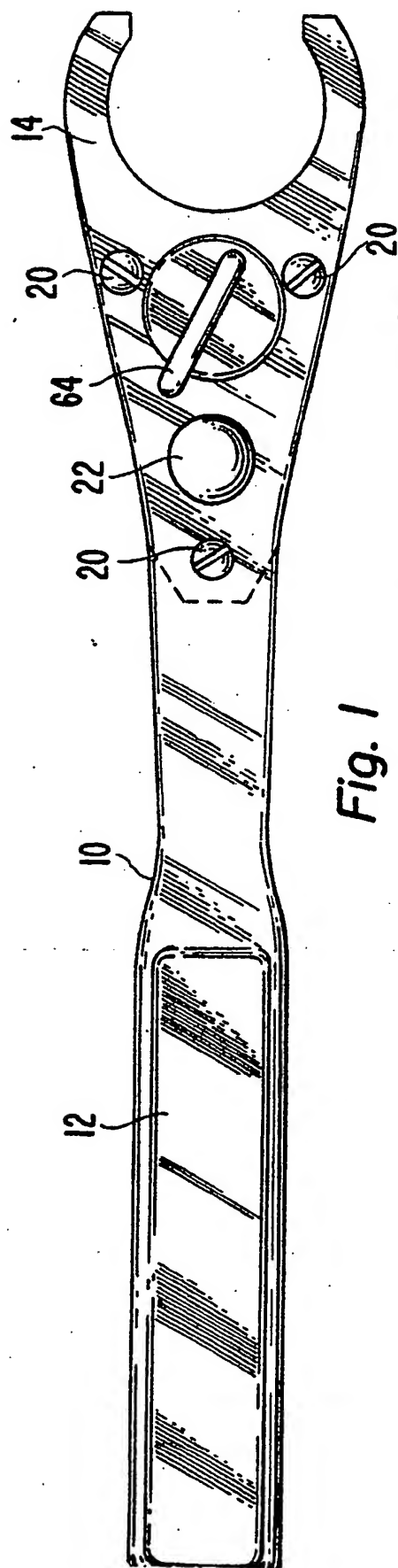
Means for expanding said yoke so that said yoke may be placed in substantially surrounding relation to said socket by means of movement of the handle member transverse to the socket axis.

2. The wrench of claim 1 wherein said yoke is adapted to closely surround more than 180 degrees but substantially less than 360 degrees of the socket.

3. The wrench of claim 1, each socket member including a recessed inner wall defining a curved guide

channel, and each yoke half having a curved rib journalled for rotation in said guide channel.

4. The wrench of claim 1, wherein said means for expanding said yoke comprises a resiliently biased
5 detent gear housing.



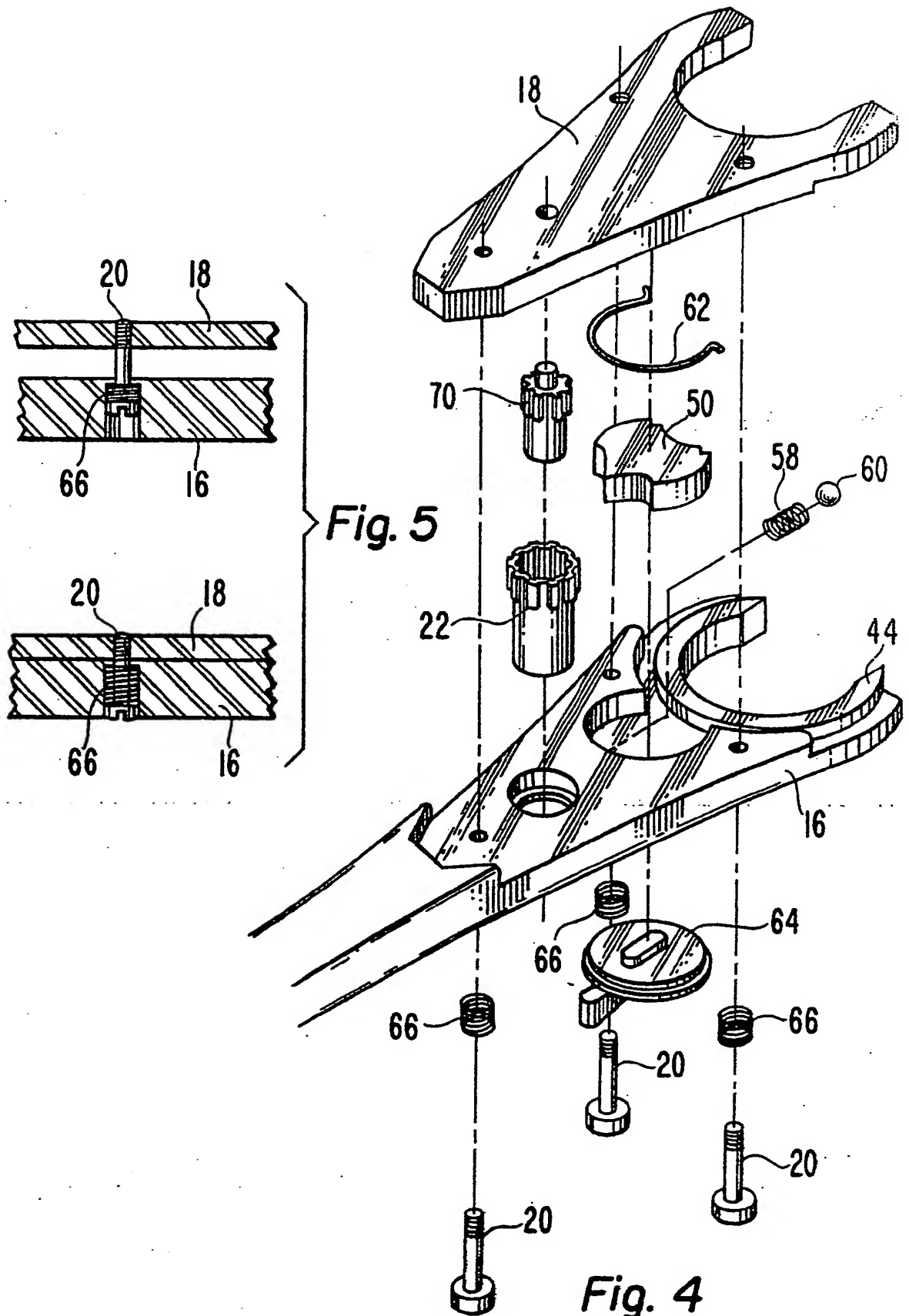


Fig. 6

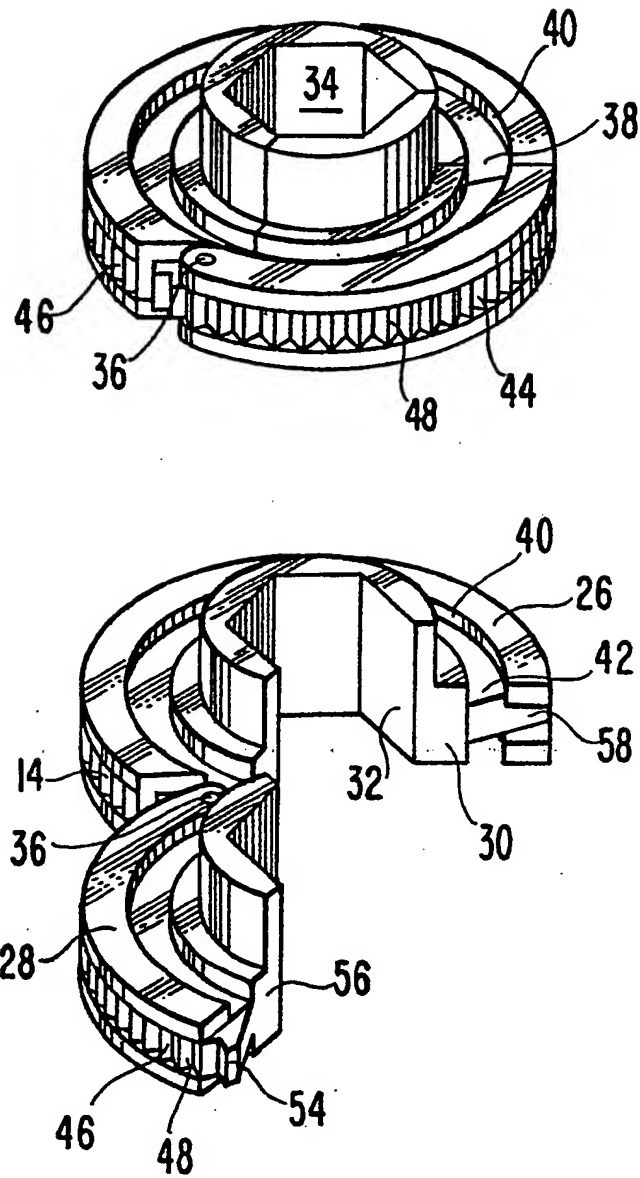
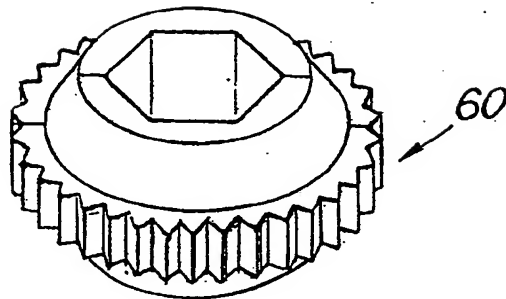
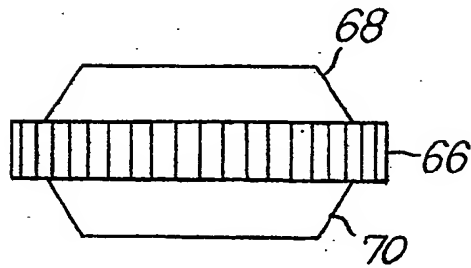
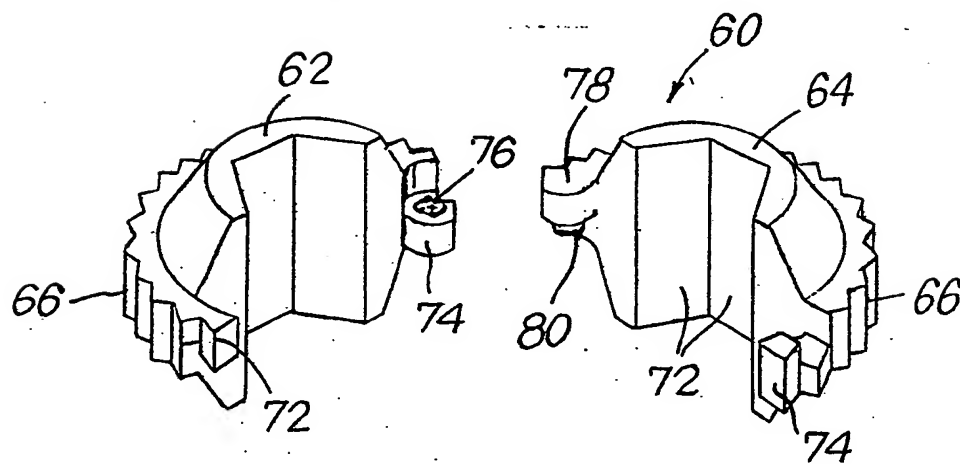
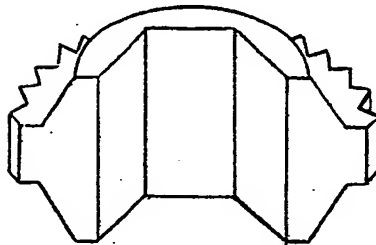


Fig. 7*Fig. 8**Fig. 9**Fig. 10*

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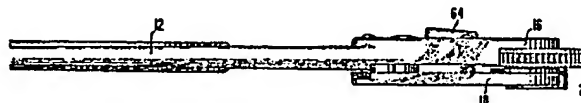
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(54) Novel socket wrench assembly.

(57) A handle member (12) terminates in an expandable yoke containing a fixed upper half (16) and an expandable lower half (18) for movement from an expanded open position for receiving a socket (24) to a closed position in driving engagement with the socket. A curved rib is formed transversely on the inner surface of each yoke half. A split ring-like nut driving socket (24) contains exterior ratchet teeth and a circular bore formed transversely through the socket with a recessed counter bore forming a circular guide channel received in rotational engagement with the curved ribs of the yoke halves (16, 18). The socket contains a curved head having lands which in combination define a polygonal wrench opening. A pawl mechanism (60) mounted on the wrench handle member is resiliently biased into engagement with the ratchet teeth.



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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 3)
Y	US-A-2 636 411 (WOOD) * Whole document *	1-3	B 25 B 13/46 B 25 B 13/06
Y	US-A-4 374 479 (MINOTTI) * Column 4, lines 17-30; figure 5 *	1-3	
A	FR-A-2 520 654 (VROMMAN)		
A	US-A-4 258 595 (RAMSEY)		
A	FR-A-1 029 033 (SA FORGES STEPHANOISES)		
			TECHNICAL FIELDS SEARCHED (Int. Cl. 3)
			B 25 B 13/00
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 18-09-1985	Examiner BELIBEL C.
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document</p>			

